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Are hand stencils in European cave art older than we think? An evaluation of the existing data and their potential implications.

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Introduction

Among his many meticulous publications on Spanish Upper Palaeolithic art, Rodrigo de Balbín Behrmann has documented many examples of the application of red pigments to cave walls directly by the fingers or hand, such as washes of red, paired or multiple lines, and finger dots (e.g. in La Lloseta [Balbín et al. 2005] and in Tito Bustillo [Balbín 1989; Balbín et al. 2002]). Perhaps the most iconic form of such interactions between the hand, pigments and cave walls are hand stencils, which are perhaps best contextualised as the most obvious extreme on a continuum of hand markings on walls. Given this, and as the chronology of cave art has been at the heart of his interests (e.g. Alcolea González and Balbín Behrmann 2007) we address here the question of the age of hand stencils as our homage to Rodrigo.

Hand stencils in European Palaeolithic 'cave art'

Since the first major discovery of hand stencils in Gargas in 1906 these have become a familiar component of the corpus of European Palaeolithic 'cave art'. From the pioneering work of Breuil onwards, much has been published about these ostensibly intimate but intellectually ambiguous images, but the scholarly community has reached little understanding about their meaning and function in a century of research. Today, hand stencils (and far less commonly, positive prints) are known (to our understanding) in 37 caves: France: 26 caves = 70.3% of the total; Spain: 10 caves = 27%; and Italy: 1 cave = 2.7%. This estimate is based on a critical assessment of claims known to us (Table 1), and supersedes that in Pettitt et al. 2014. In most cases single caves contain only one or two stencils: more rarely they contain 5-15, and larger numbers are found only in La Garma (at least 39), Fuente del Trucho (at least 40), El Castillo (at least 85), Cosquer (about 46), Maltravieso (at least 71) and, most famously, Gargas (at least 212). Production usually involved the projection of a wet pigment – primarily red but occasionally black or - via a tube or occasionally directly from the mouth, although other methods are known, such as the rubbing of pigments around the hand at Roucadour (Table 1).

Meticulous documentation of multiple hand stencils exists only for Gargas (Groenen 1988; Barrière and Suères 1993; Sahly 1966; Foucher and Rumeau 2007), Cosquer (Clottes et al. 1992; Clottes and Courtin 1996, 69-79) and Maltravieso caves (Ripoll López et al. 1999a, b). Although these account for a large sample of known stencils, on a site-by-site basis the literature is poor, but this lack of an overall corpus of data on stencils from the 38 sites has not prevented the accumulation of a relatively large literature on their production and possible meaning. One notable exception is the chronological review of García-Diez et al. (2015). Other than the on-site study of stencils in context, the literature typically reflects research focussed entirely on the *identity* of hand stencils rather than their physical context, i.e.

- The gender and age of the people whose hands were depicted (e.g. Manning et al. 1998; Gunn 2006; Snow 2006).
- Whether left or right hands were depicted (e.g. Barrière 1976; Groenen 1997; Faurie and Raymond 2004; Frayer et al. 2007; Steele and Uomini 2009), usually from the perspective of handedness and its evolution among hominins.
- Why in some caves fingers or parts of them appear attenuated (a term we prefer instead of 'missing' or 'mutilated' as it is interpretatively neutral) which is usually taken to mean either missing/mutilated or bent back (e.g. Breuil 1952; Janssens 1957; Sahly 1966; Leroi-Gourhan 1967; Pradel 1975; Hooper 1980; Wildgoose et al. 1982; Barrière and Suères 1993; Ripoll López et al. 1999a, b; Guthrie 2005, 114-32; Rouillon 2006.). We should not be too focussed on these as they occur in only a small number of caves that contain hand stencils (notably Gargas, Tibiran, Cosquer and Fuente del Trucho) and need not be central to the understanding of stencils and prints as a whole.
- The possibility that stencils/prints were "*signatures* for those who were responsible for the art on the walls" (Gregg 2008, 380 our emphasis; see also Taçon et al. 2014).

To summarise the results of research in these areas, it would probably be fair to say that most researchers agree that the left hand was overwhelmingly stencilled (presumably because 80% of the time the right hand was the active one and thus held the materials necessary for stencilling of the passive left hand); that taken at face value finger ratios and lengths are often (but not always) consistent with female hands; that in the few cases where attenuated fingers are present these are probably the result of deliberate bending rather than disease, frost bite or accident; and that there is no reason to assume that surviving stencils represent more than a

single or small number of individuals in each cave. There has been relatively little interest in the physical context of stencils, although a recent study of such in La Garma and El Castillo caves has demonstrated how stencils were commonly associated with cracks in the cave walls, and with subtle concavities and bosses, revealing an interest in the small-scale scrutiny of the cave walls (Pettitt et al. 2014).

Here, we are not concerned with the production and ‘function/s’ of hand stencils or the identity of the stencilled, but with their antiquity. It is universally assumed that they are of Mid Upper Palaeolithic age, i.e. that they are culturally Gravettian. As Lorblanchet (2010, 221), for example, has noted, “toutes les mains négatives paléolithiques datées par le radiocarbone, la stratigraphie, le contexte, ou les superpositions (Fuente del Salín, Altamira, Castillo, La Garma en Espagne), (Gargas, Hautes-Pyrénées), Cosquer (Bouches-du-Rhône), Labattut et l’Abri du Poisson (Dordogne), Moulin de Laguenay (Corrèze), Vilhonneur (Charente) *se situent au Gravettien*, entre 22,000 et 28,000 ans avec une plus grande fréquence entre 25,000 et 28,000 ans BP” (our emphasis). How robust are such conclusions? We review critically the existing data pertinent to the age of hand stencils on which such a long-standing consensus is based, and conclude that they are almost certainly older than has been previously thought. We then consider the ramifications of this conclusion.

Relative schemes and artistic associations from Breuil onwards

Breuil (1952, 38) assigned hand prints and stencils to his earliest (Aurignacian-Perigordian) art cycle on the basis of their preceding stratigraphically “all other paintings” and their apparent lack of association with anything other than “rare spots, lines of discs in series, and sometimes timid attempts at line drawing.” During the next decade Leroi-Gourhan acknowledged, however, that the dating of hand stencils was ambiguous, although a close reading of his statements makes it clear that he was aware that the little data available were not inconsistent with Breuil’s notion of a relatively early age. Thus “the [dating of] hands present one of the problems still needing clarification. The Abbé Breuil regarded them as very archaic,

and in several cases they do seem to belong to an early phase of cave decoration" (1968, 199). Leroi-Gourhan used the association of art attributable to one or more of his stylistic phases – assuming that the association was meaningful – in order to assign hand stencils to one of his four great phases of cave art. Thus, he argued "at Gargas, the cave contains only figures in Style II and Style III; at Pech Merle, the hands occur in the vicinity of figures in the earliest Style III; at Bernifal, we find them in the first chamber, opposite painted figures that are in an indefinable style, but are *a priori* earlier than the engravings in the remote part. In a few cases, such as Les Combarelles, Font-de-Gaume, and El Castillo, it was hard to place the hands chronologically in relation to a group that is predominantly style III" (ibid., 199). From this it is clear to infer that he thought that the examples of hand stencils in these caves belonged to his early Style III or earlier, thus to the Solutrean/Early Magdalenian – although only in one case did he explicitly state this (Tibiran; 1968, 321). Today we may be more critical of Leroi-Gourhan's assumption that the perceived style of art in relatively close proximity to hand stencils is a reliable indication of their age, although as we shall see below this assumption is still made and still can form the basis of assumptions about the Mid Upper Palaeolithic age of stencils.

Breuil's view - which at least partly overlapped with that of Leroi-Gourhan - prevailed, but subsequent researchers to the present day have come to view hand stencils as largely or entirely Gravettian, whether explicitly or implicitly (e.g. Barrière and Suères 1993, 49; Clottes 1998. Clottes and Courtin 1996, 166-7; Foucher et al. 2007, 83; Lawson 2012, 318; Lorblanchet 1995, 245-6; 2010, 224; Ripoll López et al. 1999b, 13; Von Petzinger and Nowell 2010. White 1993, 69). Thus although Breuil assigned stencils and prints to a phase that spanned both the Aurignacian and Gravettian, subsequent publications have come to associate them only with the Gravettian, although in no published case, however, is it clear why an *earlier* age has apparently been ruled out. A few exceptions exist. Sahly (1966, 276) viewed them as Aurignacian although did not explain why; a broader Aurignacian/Gravettian age was suggested by Bernaldo de Quirós and Cabrera (1994, 268) and by Lorblanchet (2007, 211), views that seem to be echoed by von Petzinger and Nowell (2011, 1178-80) in

their critique of stylistic dating of cave art. Clottes and Lewis-Williams (1998, 45) also suggest a broad Aurignacian/Gravettian age, although are contradicted by Clottes and Courtin (1996, 167) and Clottes (1998, 114-5) who thought the *oldest* examples were of Gravettian age. Snow (1996) recognised that some might be older than the Gravettian; Davidson (1997, 148) assumed that they are the “earliest figures in Upper Palaeolithic cave art” although referred to the stencils of Cosquer Cave as Gravettian; and Gárate (2008, 24) saw them as part of a set of human themes including human outlines and vulvae which was “significant until the Solutrean”. Bahn and Vertut (1988, 135) saw the issue as open, noting that they may span the entirety of the Upper Palaeolithic on the basis of the lack of evidence to the contrary.

The age of hand stencils and prints

Recently, García-Díez et al. (2015) critically reviewed the chronology of hand stencils in the context of new U-series minimum ages for stencils in El Castillo, concluding on the basis of production technique and colour and of a critical consideration of available chronological data, that the stencils can broadly be viewed as a diachronic phenomenon, probably an initial and non-figurative phase (Aurignacian or earlier) of European Palaeolithic cave art, of which the youngest examples were created around 27,000 cal BP. Here, we have assembled what we hope to be the most comprehensive catalogue of Upper Palaeolithic stencils (and the less frequent prints), and we assess how their age has been ascertained and conclude that in most (or all) cases they are likely to be early Gravettian at youngest, and probably much older.

As the following discussion shows, direct dates on hand stencils (AMS radiocarbon on charcoal) are remarkably rare, and where they exist may be underestimates given how long ago the dates were produced and given that pretreatment techniques have improved considerably since. Stratigraphic associations (such as when fragments of cave ceiling bearing stencils have fallen into dated contexts) are even rarer. Much ‘dating’ of stencils/prints tends to be based on perceived spatial

associations, either between the art of concern and dated archaeology, dated bones stuffed into cracks in the cave wall, or stylistically dated art. Such associations may be illusory. Most 'dating' of stencils simply reflects the dogma that they are 'Gravettian'. As we shall see, when Occam's razor is applied to cut out questionable 'dating' the results are consistent with a relatively old age for the stencils/prints for whom reliable information exists.

Dating: one stratified example

Ucko and Rosenfeld (1967, 67) were critical of a supposed stencil on a block recovered from between two Perigordian levels in the Labattut rockshelter (Dordogne), although its context is well recorded and the stencil is clear on a photo published by Delluc and Delluc (1991). It can be taken as a clear indication that the fragment of cave wall/ceiling on which the stencil was created fell during the Gravettian, the context of which therefore provides a minimum age for the creation of the stencil itself. This is perhaps not surprising given the general similarity of the Labattut art with Aurignacian rock art from shelters in the vicinity (cf. Delluc and Delluc 1991); it could be Gravettian, it may well be older.

Absolute dating: radiocarbon

Independent verification of the supposed age of stencils/prints in the form of absolute dates is very rare. Despite this rarity, the consensus has been built up that existing radiocarbon measurements support the notion of a Gravettian age, and thus stencils and prints have, like 'Venus figurines' come to be seen as icons of the European Mid Upper Palaeolithic (e.g. Foucher and San Juan-Foucher 2007. Jaubert 2008. Ucko and Rosenfeld 1967, 72).

A very few AMS radiocarbon measurements exist which are cited as constituting chronological evidence of the antiquity of stencils. Most of these are not without problems, however. In fact these few measurements take the form of:

- Measurements on objects found close to hand stencils in caves, for which a meaningful association between the two is assumed but not demonstrated beyond doubt.
- Measurements on objects found close to hand stencils in caves for which a meaningful association between the two is probably but not completely unequivocal.
- Measurements on charcoal from cave art apparently in clear association with hand stencils and thus meaningfully associated.
- Measurements on charcoal taken directly from hand stencils.

Three results of $22,580 \pm 100$ BP, $23,190 \pm 900$ BP and $22,340 +510/-480$ BP from Fuente del Salín (Moure Romanillo and González Morales 1992) actually measure charcoal taken from hearths close to the stencils of interest, although a direct measurement of $18,200 \pm 70$ BP, if correct (see below), suggests caution in the use of such apparently spatially 'associated' dates, and a measurement of $26,860 \pm 460$ BP from Gargas is actually on a bone splinter wedged into a crack near the Great Panel of Hands (Foucher and Rumeau 2007, 83). These are not clear associations, and while they demonstrate close to the location of hand stencils the burning of hearths and the insertion into a crack of the bone of an animal that died during the Gravettian (although the insertion could of course have occurred later), and are thus not inconsistent with Gravettian ages for them, they are not necessarily relevant to the stencils' age. One should be cautious of these age assignments based on association only; they are conjectural, and should not become dogma. The same caution must be applied to the hand stencil found several metres from human

remains radiocarbon dated to $27,110 \pm 210$ BP and $26,790 \pm 190$ BP in Les Garennes cave, Vilhonneur, France (Henry-Gambier et al. 2007). Once again, while the measurements presumably constitute reliable evidence of the death of this individual during the Gravettian, an association between the two is conjecture and as it has not been demonstrated should be removed from consideration.

Grotte à Margot in Mayenne is assumed to be Late Magdalenian in age but is not directly dated (Pigeaud et al. 2006). In addition to its Magdalenian archaeology the cave has yielded Aurignacian material (actually more abundant than the cave's scarce Late Magdalenian), thus while it seems to have no Gravettian activity one cannot rule out an EUP age for its four stencils; once again we would urge caution against arguing from the basis of the cave's archaeology.

A clearer association can be observed in Le Moulin de Laguenay cave, Corrèze. Here, a radiocarbon measurement of $26,770 \pm 380$ BP (Lyon-3361 Poz) was obtained on charcoal from a hearth in a thin horizon directly atop bedrock that contained fragments of spalled roof on which pigments are visible, immediately below two ceiling stencils (Mélard et al. 2010). The lack of any evidence for activity belonging to any other periods in the cave, and general scarcity of archaeological material strengthens the notion that these data pertain to the same period, but this is not unequivocally demonstrated. If such an association is valid then the measurement may only provide a minimum age for the stencils, given that it would be the spalling of art on the part of the cave's ceiling on which they were produced – not necessarily their production *per se* – that occurred in the same broad period that the hearth was lit.

A measurement of $24,640 \pm 390$ BP (Gif A 95357) was obtained on charcoal from the chest area of the right of the two dappled horses¹ of Pech-Merle, which do appear to

¹By using the normal means of reference to these, we do not mean to imply that they depict horses with dappled pelage. As Lorblanchet (2010, 105) has argued, the presence of punctuations outside the drawn outline of these animals argues against this; instead one is dealing with a complex interplay of animal outlines, punctuations, hand stencils and other signs, which may or may not reflect true pelage.

be meaningfully associated with six hand stencils in this panel on the basis of both its complex compositional phases and of pigment analysis of several elements including two stencils and the horses themselves (Lorblanchet 1995. 2010, 122-35). This has been interpreted in the light of the regional style of art in several caves of the Quercy, which is seen as fairly homogeneously Gravettian (e.g. Jaubert 2008) albeit of several phases (Lorblanchet 2010). Pech-Merle does in fact present a clear warning about the dangers of assuming the age of art on a cave's walls on the basis of radiometric dates on materials found in close proximity. A metacarpal of reindeer recovered from Sondage 1 beneath the Panel of Dappled Horses yielded a radiocarbon measurement of $18,400 \pm 350$ BP and a charcoal fragment $11,380 \pm 390$ BP (Valladas et al. 1990. Lorblanchet 2010, 18), which are clearly of much younger ages than that of the charcoal that went into the production of the dappled horses which are presumed to belong to the cave's oldest phase of art (Lorblanchet 2010, 220-5). Similarly, a charcoal fragment from Sondage VII beneath the Gravettian *Frise Noir* yielded an age of $11,200 \pm 800$ BP. In the Grande Grotte at Arcy-sur-Cure, a measurement of $26,700 \pm 410$ BP was obtained on a bone recovered at the foot of a panel which included a partial hand stencil (Baffier and Girard 2007), and measurements of $26,360 \pm 290$ BP and $26,250 \pm 280$ BP were obtained on charcoal from the floor of the Gallery of Dots in the Grotte Chauvet. Why these should pertain to the art is unclear. The dangers of assuming associations between art panels and objects immediately below them on the cave's floor should be obvious.

To our knowledge AMS ^{14}C measurements *directly* on the charcoal of a hand stencil derive only from two caves: Grotte Cosquer (Clottes et al. 1992) and Fuente del Salín (González Morales and Moure 2008). Publication of the dates from Cosquer has not been consistent but we identify at least six measurements on three hand stencils: MR7 ($27,110 \pm 430$; $27,110 \pm 400$; $26,180 \pm 370$); M12 ($24,840 \pm 340$; $23,150 \pm 620$) and M19 ($27,740 \pm 410$) although the lack of supporting information renders it impossible to evaluate these independently. A direct AMS radiocarbon measurement of $18,200 \pm 70$ BP on a stencil from Fuente del Salín (González Morales and Moure 2008); this was measured at Geochron without full pretreatment, so this

must be regarded as questionable. The lesson with these direct dates is not to publish AMS measurements resulting from samples that have been incompletely pretreated; how can one be confident that all contaminating carbon has been removed?

Thus we are left with only two sites where direct dates on stencils exist, and one (Pech Merle) where a plausible relationship exists between dated art and stencils that seem to be part of the same panel: Pech-Merle and Cosquer. These were, however, measured two decades ago; available samples sizes for measurement of these would be problematically small at the time, and modern pretreatment methods for charcoal which have been proven to be more successful removing contamination would not have been available, thus for these reasons specialists today would presumably view these as inaccurate (probably minimum) ages. Higham (2011) has, for example, demonstrated considerable problems with the accuracy of measurements on charcoal for samples older than 20,000 ^{14}C BP that were produced using the previously routine acid-base-acid pretreatment for charcoal; re-measuring several samples from the Grotta di Fumane using the more rigorous ABOx-SC method ages were obtained that were typically 2-4kyr older than the previous measurements (and in some cases more). We would expect that the minuscule samples of charcoal removed from the cave art samples of concern here would compound the problem even further. With regard to the remaining measurements from Fuente del Salín, the lack of explicit published information on pretreatment and measurement precludes independent assessment of the accuracy of the measurements.

What are we to make of such a poor database? First, that consensus can emerge among archaeologists on the basis of relatively poor data; when we critically examine the database on which our assumptions are made it becomes clear how unsound some of our conclusions can be. Secondly, that the very few measurements that can be taken as at all reliable suggest that the hand stencils of concern are at least of Gravettian age *but in fact could be considerably older*. One should of course put this in perspective: almost all hand stencils known to us have no direct dates, i.e.

the assumption on the basis of stylistic associations that they are of Mid Upper Palaeolithic age has not been independently verified by reliable radiometric dating. Viewed from this perspective we regard the issue of the age of hand stencils as open.

Absolute dating: U-series

Recent U-series dating of stalagmites overlying two stencils in El Castillo has provided clearer indications of their minimum ages, in this case of ~24,000 and ~37,000 years ago (Pike et al. 2012). U-series dating of calcite deposits has several advantages over ^{14}C dating of charcoal pigments in that it doesn't require the presence of organic pigments, nor suffers from the 'old wood' effect, and can be verified by stratigraphic consistency of dates along the growth axis of the calcite. These new results provide independent verification of the early age of stencils as suspected by Breuil, and in the case of the oldest measurement clearly a pre-Gravettian cultural context. They are part of a suite of dates on various motifs, including disks and hand stencils, from several caves that show that red non-figurative painting dates back at least to the Aurignacian in Northern Spain.

The age of hand stencils and some possible implications

Overall, the reliable chronometric data available at present are consistent with the notion that stencils and prints belong to an early, largely non-figurative phase of cave art, prior to a subsequent rise to dominance of animal figures that began in the Gravettian and culminated in the Magdalenian (Ripoll López et al. 1999, 73. Gárate 2008; García-Diez et al. 2015). As Breuil noted artistic associations of hand stencils are typically with disks ('punctuations') usually produced by a similar method of pigment projection, and possibly with animal outlines assumed to be early

Gravettian in age (although this needs verification). Some simple conclusions clarify the issue somewhat:

- Artistic associations, where demonstrable, support Breuil's view that hand stencils belong to a relatively early (or indeed the earliest) artistic period.
- By contrast, caves that seem to contain parietal art of exclusively Magdalenian age – e.g. several in the valley of the Lot river in Quercy (Lorblanchet 2010, 406-27) – do not contain hand stencils. There are, therefore, no associations between hand stencils and post-Gravettian art.
- Radiocarbon measurements have indicated an early to late Gravettian age for a very few stencils, but these were produced a long time ago with previous laboratory methods and are almost certainly inaccurate underestimates. Even if they are chronometrically reliable they probably indicate minimum ages.
- Preliminary U-series measurements attest a Gravettian age *as a minimum*, and in one case a clearly pre-Gravettian age; a date — older than 39.9 ka — falling clearly in pre-Gravettian times has also been obtained for the one example of a hand stencil outside Europe (the Leang Timpuseng cave in Sulawesi) where U-series was applied to overlying calcite (Aubert et al. 2014). In Europe and Sulawesi artistic associations place hand stencils in the context of broader non-figurative art.
- If the early age of stencils is borne out by further analyses it may be of interpretive importance, given that they fall into a conceptual space between non-figurative and figurative art, and it may be no coincidence that their creation forms an *outline* (of a hand) in the same period as simple animal outlines were emerging in parietal art.

If, then, hand stencils belong to an early – perhaps the earliest – phase of European cave art, one should view them in the context of the emergence of the evolution of art. What exactly are hand stencils: figures or signs, or something in-between? Might they have played a role in the evolution of figurative art in Europe? Stencils form part of a continuum of marks on the walls, ceilings and floors of caves created by direct contact with parts of the body, from foot and hand prints (Lorblanchet 2009) and finger meanders (Sharpe and Van Gelder 2006), through positive palm prints (Clottes and Courtin 1996), finger and hand ‘rubbing’ (Lorblanchet 2010) to the projected pigment hand stencils and positive prints that are of concern here. A conceptual continuity runs through this set of examples, from ‘natural’ markings (which one might conceive of as the *reproduction* of the outline of the hands or fingers through impressions) and the artificial creation of (one might say *representation*) of the outline of the hands using the projection or rubbing of pigments. In a sense hand stencils are both figurative (in that they ‘depict’ a human hand) and non-figurative (in that they are not conscious *drawings* of the hand but an attempt to fix the outline of the hand in place). Is it possible that their very nature at the borders of the figurative and non-figurative, and their apparent appearance just as figurative art is emerging in European caves, suggests they played a role in the recognition that *things* could be *figured* in art? If the hand could be represented in outline, then why not animals?

The apparently older age of hand stencils also raises the question of their authorship. It is important to recognise that the chronology we have for them at present is poor, and is entirely comprised of *minimum* ages. While these may belong to Aurignacian or Protoaurignacian cultural contexts – and thus presumably indicate that the stencilled and stencillers were *Homo sapiens*, can we eliminate the possibility that they were made by, and depict Neanderthals? Further minimum ages for hand stencils should at least be able to test this hypothesis.

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Table 1. Corpus of caves containing hand stencils/prints known to the authors. Note that some counts of hand stencils/prints include an example from Cougnac (e.g. Ripoll López et al. 1999, Figure 115). This is actually a *main essuyée/frottée* (a 'wiped' or 'rubbed' hand) produced by dragging fingers covered in black pigment down the wall (Lorblanchet 2010, 274-5; see also Lorblanchet 2009 for a wider discussion of these). This is not a depiction of a hand, and in fact is much closer to finger tracings than to hand stencils, and for this reason we omit it from our quantification. Similarly, a circle of 5 finger dots from the cave (ibid., 257) is excluded. We also omit the *main frottée* in the Grotte du Cantal, Lot (Lorblanchet 2010, 394), and possible

engravings of hands in Bara-Bahau and Ebbou, the former of which was suggested by the Abbé Glory but it is debatable, and the latter probably a natural stain (Paul Bahn pers. comm.). We also omit caves which have from time to time been reported informally as having hand stencils but which do not, i.e. Le Portel, El Pindal (actually a red disk - González-Pumariaga Solís 2011), Oxocelhaya, Grotte du Cheval (these are actually all finger tracings); we also omit sites for which a possible stencil has been suggested but which nevertheless remains unclear (one between two bovids in Gallery B of La Pasiega: Balbín and González Sainz 1992; González Sainz and Balbín 2000); and omit three stencils in La Lastrilla for which a Palaeolithic ascription is not certain.

Site	Notes	Dating (chronometric)	Assumed dating (associations &c)	References	No.
France (N=26)					
Abri du Poisson	1 black stencil.	/	Assumed to be Gravettian on the basis of wider comparisons. Close proximity to engraved salmonid. Archaeological levels contain Aurignacian, Gravettian (Noaillian) and Solutrean levels.	Roussot 1984a. Delluc and Delluc 1991.	1
Baume-Latronne	5 differing red prints.	/	Prints are located away from the cave's figurative art (thought to be Solutrean) and finger tracings.	Leroi-Gourhan 1968. Drouot 1984a.	2
Bayol (de Collias)	6 prints (5 adult, 1 child) of reddish clay	/	Dating of cave's figurative art – amidst which the prints are located – is unclear: possibly Solutrean.	Leroi-Gourhan 1968. Drouot 1984b.	3
Bédeilhac	2 black prints, each with a red thumb.	/	Parietal art includes numerous black and red dots: figurative art of Middle and Late Magdalenian.	Gailli et al. 1984. Gailli 2006, 99-100.	4
Bernifal	1 brown/black stencil; 2 or 3 other possible engraved hands opposite this	/	Stencil found in close proximity to mammoth of same colour which (like the rest of the cave's	Leroi-Gourhan 1968. Roussot 1984b.	5

	(alternatively these could be <i>motifs arborescents</i>).		figurative art) is thought to be Magdalenian. Breuil saw the hand/s as Aurignacian.		
Grotte du Bison	2 black stencils.	/	/	Rousot 1984c.	6
Bourgneton	1 brown/red stencil.	/	Three finger traces of the same colour 10cm from the stencil.	Lorblanchet 1984a.	7
Chauvet	11 in red(6 prints and 5 stencils).	/	Assumed to be early on the basis of associations & the wider reconstruction of the cave's chronology.	Clottes 2003.	8
Les Combarelles (Section 1)	1 black stencil.	/	Breuil thought the stencil Aurignacian: Combarelles 1 engravings are early and Middle Magdalenian.	Barrière 1984a.	9
Combe-Nègre 1	1 stencil in black, not blown but produced by a wash (<i>badigeon</i>) possibly similar to those of Roucadour (see below).	/	Assumed to be Gravettian on the basis of wider regional parallels. Black punctuations, animal outlines in black.	Lorblanchet 2010, 390-2.	10
Cosquer	65 stencils in red (21) and black (44).	At least six AMS radiocarbon measurements on three hand stencils: MR7 (27,110 ± 430; 27,110 ± 400; 26,180 ± 370); M12 (24,840 ± 340; 23,150 ± 620) and M19 (27,740 ± 410).	Assumed to be Gravettian on the basis of associations and the direct radiocarbon measurements.	Clottes et al. 2007. (Clottes and Courtin1996 for an earlier publication with lower count of stencils). Rouillon 2006.	11
Erberua (IsturitzInférieur)	3 stencils (2 red, 1 black) (in cave's 7 th ensemble) 1 black.	/	Ensemble VII contains Magdalenian engravings as with the other of the cave's ensembles.	Larribau and Prudhomme 1984.	12

Les Fieux	14 stencils (12 red, 2 black) in two groups.	/	Assumed to be Gravettian or earlier on the grounds of associations and wider regional parallels e.g. Pech-Merle. Red punctuations and lines, animal outline engravings.	Lorblanchet 2010, 323-7.	13
Font de Gaume	4 black stencils.	/	Cave's archaeology contains Mousterian, Aurignacian, Gravettian, Solutrean and Magdalenian levels. Figurative art is Magdalenian: Breuil thought the stencils Aurignacian.	Leroi-Gourhan 1968. Roussot 1984d.	14
Les Garennes (Vilhonneur)	1 black stencil.	/	Assumed to be early Gravettian on the basis of proximity of the stencil to absolutely dated human remains from the cave floor. Art includes red dots, black bars and other traces of colour.	Henry-Gambier et al. 2007	15
Gargas	At least 212 stencils (Groenen), possibly 231 (Barrière) in red, maroon, black and white. 137 cluster together in Salle 1.	/	Engraved animal outlines, finger traces. Assumed to be Gravettian after Breuil; on the basis of one radiocarbon measurement (see text); the basis of the cave's archaeology, and probably closure shortly after the late Gravettian.	Sahly 1966. Pradel 1975. Barrière 1976. 1984b Barrière and Suères 1993. Groenen 1988. Foucher et al. 2007.	16
Grand Grotte at Arcy-sur-Cure	8 stencils and 1 print in red	/	Assumed to be Aurignacian or Gravettian on the basis of the cave's archaeology. AMS radiocarbon	Baffier and Girard 2007.	17

			measurement of 26,700 ± 410 BP on bone found below panel including a partial stencil.		
Labattut (or Labatut)	1 black stencil on detached ceiling block.	/	Stratigraphically earlier than the upper level of Perigordian V with Noailles Burins (Noaillian) = early Gravettian or older.	Delluc and Delluc 1984.	18
Grotte (à) Margot	2 black hand stencils (one with attenuated fingers). 2 positive brown prints.	/	Assumed to be Late Magdalenian on the basis of the cave's archaeology, figurative engravings with similarities to other regional examples of Magdalenian art, and lack of Gravettian in the region, but the cave's Aurignacian is more abundant than its Magdalenian.	Pigeaud et al. 2006. Jaubert and Feruglio 2007.	19
Moulin de Laguenay	2 black stencils.	/	Assumed to be Gravettian on the basis of wider regional parallels, and presumed association with hearth dated to ~26-27 ka (uncal) BP.	Lorblanchet 2010, 399. Mélard et al. 2010.	20
Les Merveilles (Rocamadour)	6 hand stencils (four red, 2 black).	/	Red punctuations, animal outlines in red and black. Assumed to be Gravettian on the basis of wider regional parallels.	Lorblanchet 2010. Leroi-Gourhan 1968.	21
Pech Merle	11 stencils and 1 positive print in black and red, 6 of which belong to the Dappled Horses Panel.	Radiocarbon measurement of 24,640 ± 390 BP (Gif A 95357) on charcoal from right hand horse in the	Art of the cave's (earliest) 'Sanctuaire A' art phase including black stencils of the dappled horse panel; punctuations and red	Leroi-Gourhan 1968. Lorblanchet 1984b. Valladas et al. 1990. Lorblanchet 2010, 12-227.	22

		Dappled Horse panel of which hand stencils are part.	hand stencils of the 'femmes-bisons' sector.		
Roucadour	13 stencils in red and black in six panels (the second richest in the Quercy after Les Fieux). These were, however, produced by a method as yet unknown elsewhere, notably the rubbing/washing of red pigment across an elaborate area of fine incisions; as a result they should be viewed as <i>representations</i> not <i>reproductions</i> of the outline of hands.	/	Assumed to be Gravettian on the basis of wider regional parallels.	Lorblanchet 1984c. 2010, 351-2; 363.	23
Tibiran	At least 11 (possibly 18) stencils in red and grey, clustered in two panels.	/	Contains finger engravings. Figurative art is Middle Magdalenian.	Leroi-Gourhan 1968. Clot 1984. Pradel 1975.	24
Trois-Frères	5 red stencils.	/	Associated with numerous red points and traces. Breuil thought the stencils Aurignacian: cave's figurative art is Middle Magdalenian.	Bégouën and Clottes 1984.	25
Roc de Vezac	2 juxtaposed stencils (1 black, 1 red).	/	Unclear.	Aujoulat 1984.	26
Spain (N=10)					
Altamira	2 red prints and 4 violet stencils.	/	Assumed to be Aurignacian (or earlier) based on U-series minimum ages obtained for other	Saura Ramos 1999. García-Díez et al. 2013 (dating).	27

			red dots and images.		
Ardales	9 hands: 2 stencils (black) and 7 prints (red)	/		Espejo Herrerías and Cantalejo Duarte 2006. Mijares 2011.	28
Askondo	1 red print.	/	Probably Palaeolithic.	Gárate and Rios 2012.	29
El Castillo	At least 85 stencils in red.	U-series dating of stalactite overlying stencil of the Panel de las Manos provides minimum age of ~37 ka cal BP. Similar for a red disk on the panel provides minimum age of ~40 ka cal BP.	The cave's art probably relates to several periods: ongoing research is showing that the hand stencils and red dots are at least early Gravettian and probably older.	Leroi-Gourhan 1968. Pike et al. 2012 (dating). Groenen 2012.	30
Cudón	1 stencil in red; the only one in Cantabria with attenuated fingers.	/	/	/	31
Fuente del Salín	14 stencils in red and black.	Direct AMS radiocarbon Measurement of $18,200 \pm 70$ BP on stencil (GX-27757-AMS) with incomplete pretreatment.	AMS radiocarbon measurements of $22,580 \pm 100$ BP, $23,190 \pm 900$ BP and $22,340 +510/-480$ BP on charcoal from hearths below stencils.	Bohigas et al. 1985. Moure and González Morales 1992. Moure et al. 1985. González Morales and Moure 2008.	32
Fuente del Trucho	~40 stencils of adults and infants clustered in 2 zones; 37 red, 3 black. This is probably an underestimate as more may be revealed with future cleaning: it has been conjectured that as many as 100 may eventually be revealed.	U-series dating of stalactites stratified above one stencil indicate a minimum age of 27,000 (cal) BP.	Assumed to be early on the basis of superimpositioning of later figurative art on stencils; probably pre-solutrean.	Utrilla et al. 2013. 2014.	33
La Garma	At least 39 stencils in red (24)	/		González-Sainz 2003.	34

	and yellow (15).				
Maltravieso	At least 71 red stencils.	/	Assumed to be Gravettian on the basis of wider parallels, e.g. Gargas. Unclear associations: possibly red triangles, meanders.	Ripoll López et al. 1999a. 1999b.	35
Tito Bustillo	1 red stencil. Possibly a second.	/	Unclear: potentially Early Upper Palaeolithic.	Saura Ramos and Pérez-Seoane 2007.	36
Italy					
Paglicci	At least 3 stencils. Colour is unclear: this appears red but could be due to the rock; some white colourant is visible (M. Mussi pers. comm.)	/	Usually assumed to be Gravettian due to parallels with stencils elsewhere, or Solutrean on the basis of the style of the cave's horse depictions.	Zorzi 1962. Mussi 2000, 264-5.	38

Figure 1. Selection of French and Spanish hand stencils. Clockwise from top left: El Castillo (placed in concave depression); La Garma (small group); Ardales (on stalactite); Pech Merle (with red discs). Photo credits: Gobierno de Cantabria (La Garma and El Castillo), Pedro Cantalejo Duarte (Ardales) and Paul Bahn/Jean Vertut (Pech Merle).

